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Before the
Federal Communications Commission
Washington, D.C. 20554
SEP 17 3 10 1993

ET Docket No. 92-152

In the Matter of

Revision of Part 15 of the Rules to
harmonize the standards for digital
devices with international standards.

REPORT AND ORDER

Adopted: August 20, 1993; Released: September 17, 1993

By the Commission:

INTRODUCTION

1. By this action, the Commission is amending Part 15 of its rules to harmonize the United States standards for radio frequency (RF) emissions from digital devices with the international emissions standards for these devices. The new rules will permit parties applying for authorization of a digital device to choose to demonstrate that the device complies with either the existing Part 15 standards or the international standards developed by the International Special Committee on Radio Interference (CISPR). This will permit manufacturers to use the same laboratory measurements to demonstrate compliance with the emissions standards of all countries recognizing the CISPR standards, and thereby reduce the costs and other burdens of compliance testing. The new rules are intended to promote the ability of the United States manufacturers to compete fairly and effectively in international markets.

¹ See 47 CFR Section 15.3(z) and 47 CFR Sections 15.107-15.117, Part 15 was recently revised to establish uniform technical standards for unintentional radiators. See *First Report and Order*, GEN Docket No. 87-389, 4 FCC Rcd 3493 (1989) ("*Report and Order*").

² See 47 CFR Section 15.101, 47 CFR Sections 2.951-2.957 and 47 CFR Sections 2.1031-2.1045.

³ Japan also has adopted voluntary standards based on CISPR recommendations, and other countries are in the process of aligning their requirements with the CISPR standards.

⁴ CISPR Pub. 22 was first issued in 1985. Since then several amendments to CISPR Pub. 22 have been adopted after having been published as Draft International Standards (DISs) -- see documents CISPR/G (Central Office) 2, CISPR/G (Central Office) 5, CISPR/G (Central Office) 9, CISPR/G (Central Office) 11, CISPR/G (Central Office) 12, CISPR/G (Central Office) 13, and CISPR/G (Central Office) 14. These changes will be incor-

BACKGROUND
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2. Digital devices, such as computers, generate and use RF energy. These devices are subject to standards contained in Part 15 that limit radio noise emitted by unintentional radiators.¹ Part 15 also provides that digital devices must be authorized by the Commission or verified, depending on the type of device, under Part 2 of the rules prior to marketing.² The equipment authorization procedures of Part 2 require that the manufacturer or importer of a device demonstrate that the device complies with the applicable technical standards.

3. The standards in Part 15 apply only to products marketed in the United States. Many other countries, most notably those of the European Community, are in the process of requiring digital devices to comply with standards developed by CISPR for controlling interference.³ CISPR is a voluntary standards-making organization under the auspices of the International Electrotechnical Commission (IEC). CISPR develops recommendations for limits and methods of measurement to control radio interference generated by computers and various other devices. CISPR Publication 22 contains limits and measurement methods for Information Technology Equipment, which includes the same equipment that the FCC defines as digital devices.⁴

4. The CISPR Pub. 22 standards were derived from FCC standards that were first adopted in 1979.⁵ In general, the CISPR limits are similar to, or slightly more stringent than, the Part 15 standards. The CISPR limits are more lenient only with regard to conducted emissions for one class of equipment, Class A, business and commercial, and for one narrow frequency band, 450-500 kHz.⁶ Unlike the Commission's rules, the CISPR standards do not specify limits for emissions on frequencies above 1000 MHz.⁷

5. On July 10, 1992, we adopted a *Notice of Proposed Rule Making* ("*Notice*") which proposed to harmonize our technical standards for digital devices with the international standards contained in CISPR Pub. 22, including all amendments to date.⁸ This *Notice* was issued in response to Petitions for Reconsideration to the *Report and Order* adopting the new Part 15 rules filed by the Computer and Business Equipment Manufacturers Association (CBEMA) and NCR Corporation. In the *Notice*, we recognized the petitioners' position that harmonization could be advantageous for many equipment manufacturers by permitting products manufactured for sale within the U.S. to be marketed in countries following the CISPR specifications, thereby reducing design and testing burdens and costs.

porated into a new Second Edition of CISPR Pub. 22, which should be released in the near future. The First Edition of CISPR Pub. 22 and the above amendments are available for purchase from: the American National Standards Institute (ANSI), Sales Department, 11 West 42nd Street, New York, NY 10036, (212) 642-4900.

⁵ See *First Report and Order - Technical Standards for Computing Equipment*, Docket No. 20780, 44 Fed. Reg. 59530, October 16, 1979. FCC staff and other U.S. representatives continue to actively participate in the CISPR standards-making process.

⁶ A comparison of the standards in Part 15 and in CISPR Pub. 22 is contained in Appendix B.

⁷ The FCC Rules do not, however, require emissions above 1000 MHz to be measured unless the digital device generates or uses signals at 108 MHz or higher. See 47 CFR Section 15.33(b).

⁸ See *Notice of Proposed Rule Making*, ET Docket No. 92-152, 7 FCC Rcd 4872 (1992).

6. In the *Notice*, we proposed to harmonize our digital device standards with those in CISPR Pub. 22, as amended, by revising Part 15 to state that, for emissions below 1000 MHz, we would accept a demonstration of compliance with the CISPR Pub. 22 standards in lieu of compliance with the technical standards in Part 15. As there are no CISPR standards for emissions above 1000 MHz, we proposed to continue to require compliance with the existing Part 15 limits in order to protect existing and planned radio services operating above 1000 MHz from potential interference. For emissions below 1000 MHz, we proposed that manufacturers of digital devices be required to demonstrate compliance with either the CISPR standards or the Part 15 standards without intermixing these standards.⁹ Comments were invited on the suitability of this approach and on any possible increased interference concerns that might arise from use of those CISPR standards that are less stringent than the Part 15 standards. Comments were also invited on the suitability of the measurement procedure contained in CISPR Pub. 22 and whether we should require that CISPR Pub. 22 measurements be made using the measurement procedure currently specified in our rules. As a separate matter, we also proposed to amend Part 15 to reflect the 13 dB relaxation of the emissions limits for broadband emissions conducted onto the AC power lines that is in our measurement procedures.¹⁰ Since the proposed changes to the regulations are not expected to have an adverse impact on any manufacturer of digital devices, we proposed that these changes become effective upon the date the Report and Order in this proceeding is published in the Federal Register.

7. Seventeen comments and two reply comments were received in response to the *Notice*. A list of the responding parties is provided in Appendix A. The abbreviations used to identify individual commenting parties in the discussion which follows are also indicated in this Appendix.

DISCUSSION

8. *Basic Elements of Harmonization.* All of the commenting parties support our proposal to permit digital devices to demonstrate compliance with the standards in Part 15 or, alternatively, the standards contained in CISPR Pub. 22, for emissions limits below 1000 MHz without intermixing standards. As stated by CBEMA, "[a]n ever-increasing number of our domestic manufacturers are marketing advanced products outside of the United States. ... Allowing manufacturers the flexibility to choose between the standards embodied in Part 15 and those embodied in CISPR [Pub.] 22 should greatly assist those companies with multi-national

aspirations by reducing the number of tests they must undertake and test procedures they must follow in order to lawfully market their products both domestically *and* internationally.¹¹ Tandy adds that "... the potential reductions in product design and testing costs ... may assist a number of smaller manufacturers to enter foreign markets that they were previously precluded from because of cost considerations. These developments, in turn, cannot but help improve this nation's position in the global economy and, by extension, affect our domestic economy for the better."¹² As also stated by The League, AT&T, Cardinal, and Tandy, the CISPR Pub. 22 standards are adequate to ensure that digital devices do not cause harmful interference to other radio services.¹³ We continue to believe that harmonization of our standards for digital devices with the international standards for these devices will provide significant benefits for U.S. manufacturers competing in international markets, as described by the commenting parties. We also conclude that CISPR standards will provide protection against interference caused by emissions from digital devices that is essentially the same as that afforded by the Part 15 standards. Accordingly, we are adopting this part of our proposal.

9. The commenting parties also support our proposal to retain the limits in Part 15 for radiated emissions above 1000 MHz, and measurement requirements where the device generates or uses signals at 108 MHz or higher.¹⁴ As indicated in the *Notice*, CISPR Pub. 22 does not contain emissions limits above 1000 MHz. Further, the clock frequencies used in digital devices are increasing, with a resulting increase in emissions at higher frequencies. Thus, the Part 15 limits above 1000 MHz must be retained, even if compliance with the CISPR standards is demonstrated below 1000 MHz, to protect radio operations in these higher frequency bands from potential harmful interference. As we are not changing the standards above 1000 MHz, this action should not adversely impact manufacturers of digital devices. Accordingly, we are adopting this part of our proposal.

10. The commenting parties also support the proposal to place within the regulations the 13 dB relaxation for broadband emissions conducted onto the AC power lines that is currently contained in the measurement procedures. This relaxation has long been permitted under the measurement procedures for various Part 15 devices.¹⁵ Referencing this relaxation only within the measurement procedures makes it more difficult for a manufacturer to readily determine the standards that apply to its product. The appropriate location for this allowance is in the regulations. Accordingly, we are adopting this part of our pro-

⁹ The *Notice* proposed that the relatively few relaxations contained in CISPR Pub. 22 would be acceptable only if they are offset by the other more stringent requirements of CISPR Pub. 22.

¹⁰ This change was requested by CBEMA in its Petition for Reconsideration of the new Part 15 rules. Our existing measurement procedures permit 13 dB to be subtracted from the measured conducted emissions if the difference between the emission levels measured with a quasi-peak detector and with an average detector is 6 dB or greater. This 13 dB allowance is provided because of the difference in interference potential between broadband and narrowband emissions. See "FCC Procedure for Measuring RF Emissions from Computing Devices," FCC/OET MP-4, July 1987, Section 4.2.2, Note 2, and ANSI C63.4-1991. See, also, "FCC Methods of Measurements for De-

termining Compliance of Radio Control and Security Alarm Devices and Associated Receivers," FCC/OST MP-1, 1983, Section 4.6. See, also, 47 CFR Section 15.31(a).

¹¹ Comments of CBEMA at 1-2.

¹² Comments of Tandy at 5.

¹³ As indicated earlier, the standards in CISPR Pub. 22 are similar to, or slightly more stringent than, the Part 15 standards.

¹⁴ CRI and Tandy request that when CISPR eventually adopts emission limits above 1000 MHz, those emission limits be applied to digital devices that also demonstrate compliance with the CISPR standards below 1000 MHz. This issue is addressed below under the discussion regarding future changes to the CISPR standards.

¹⁵ See footnote 10, *supra*.

posal. We are not, however, adopting the requests from CBEMA and IBM that both broadband and narrowband emission limits, differing by 13 dB, be specified in the Part 15 regulations.¹⁶ We note that the CISPR Pub. 22 standards specify a 13 dB difference between narrowband and broadband conducted emission limits for Class A digital devices. The difference in CISPR Pub. 22 for Class B devices is only 10 dB. Further, the Commission's measurement procedures do not actually provide a 13 dB difference between narrowband and wideband emissions. Rather, we permit 13 dB to be subtracted from the quasi-peak measurement if the difference between the average and the quasi-peak measurements is at least 6 dB. Thus, the effective difference between the average and the quasi-peak limits under our measurement procedures may be as low as 6 dB. Accordingly, we are declining this request by CBEMA and IBM as being outside the scope of our proposal. Specific quasi-peak and average limits will, however, be effectively implemented for digital devices by our decision to permit compliance to be demonstrated with the CISPR Pub. 22 standards.

11. *Measurement procedure.* In the *Notice*, we invited comments on the suitability of the measurement procedure contained in CISPR Pub. 22 for demonstrating compliance and whether we should require that CISPR Pub. 22 measurements be made using the measurement procedure currently specified in our rules. We addressed this question out of concern that there are relatively few measurement details in the test procedure in CISPR Pub. 22. It appeared that the test procedure in ANSI C63.4, which the Commission has incorporated in its Regulations by reference, would be more suitable.¹⁷ ANSI C63.4 contains a well defined measurement procedure, providing repeatability between measurements and reliable test results. Further, the procedure in ANSI C63.4 was recently developed based on an industry consensus as to the methods that should be used to test digital devices.

12. Objections to requiring use of ANSI C63.4 for testing digital devices to the standards in CISPR Pub. 22 were filed by AEA, AT&T, BT, CBEMA, CRI, SGI, Tandem and Tandy. In general, these parties argue that requiring use of ANSI C63.4 would minimize the benefits of harmonizing our standards, as this would necessitate that equipment still be tested twice: once under C63.4 for the U.S. market and again under CISPR Pub. 22 for markets outside the U.S.¹⁸ AT&T, BT, Tandem, and Tandy indicate that foreign countries using CISPR Pub. 22 require testing using the Pub. 22 measurement procedure. CRI states that countries that adhere to CISPR Pub. 22 cannot be expected to understand

or necessarily accept the Commission's measurement procedure as an alternative to the CISPR procedure. These parties submit that if the new regulations result in duplicate testing, they will not fulfill the Commission's intent of reducing design and testing burdens and costs to manufacturers.

13. Objections to using the test procedure in CISPR Pub. 22 were submitted by Cardinal and HP. Cardinal, while agreeing with the above comments that the measurement procedure and test site design must meet the requirements of the overseas authorizing agency, expresses concern that the procedures in CISPR Pub. 22 are not well defined. HP states that ANSI C63.4 documents a well thought out, industry consensus procedure for testing digital devices, and that CISPR Subcommittee G is looking at including in CISPR Pub. 22 many of the measurement details in C63.4. HP adds that the Commission's goal should be to achieve harmonization of the measurement procedure with CISPR through the continuing joint effort of the Commission's staff and ANSI.

14. We conclude that the measurement procedure specified in ANSI C63.4, rather than that of CISPR Pub. 22, should be employed for testing for compliance with the CISPR standards. The detailed testing methodology in ANSI C63.4 minimizes confusion as to the proper test configurations and methods that should be employed, increases reliability of the test results, and facilitates repeatability of the measurement results. The measurement procedures in CISPR Pub. 22 are much less specific and could lead to significant variations in actual testing practices. We also note, as pointed out by some commenting parties, that CISPR is currently considering adoption of many of the details in the ANSI C63.4 test procedure.¹⁹ While several commenting parties suggest that the test procedures in ANSI C63.4 would not be accepted by foreign countries, no specific instances of where this would occur were submitted to support these claims. Indeed, it is our understanding that several testing laboratories currently employ the ANSI C63.4 procedure for CISPR testing and that measurement data obtained under this procedure are being accepted by foreign agencies conforming to the CISPR standards. In addition, it appears that nothing in the ANSI C63.4 measurement procedure is inconsistent with the CISPR test procedure.²⁰ Thus, use of the ANSI C63.4 procedure will not necessitate dual testing but can be used to permit digital device manufacturers to market a product world-wide based on a single set of measurements.²¹ Ac-

¹⁶ If the rules are amended to specify both broadband and narrowband conducted limits, CBEMA and IBM state that if the unit under test meets the broadband limit, as tested with a quasi-peak detector, but fails the narrowband limit, compliance with the narrowband limit may be demonstrated using an average detector.

¹⁷ See 47 CFR Section 15.31(a)(6).

¹⁸ Some commenting parties, such as AEA and SGI, express concern that requiring use of ANSI C63.4 would also require Class B radiated emissions to be measured at the distance currently specified in Part 15, *i.e.*, 3 meters, which is not permitted under CISPR testing. This is not the case, and that issue is discussed later in this document.

¹⁹ Amador indicates that the Japanese VCCI organization recently (October 1992) changed its test site regulations to comply with the criteria in ANSI C63.4. AT&T states that the differ-

ences between the ANSI C63.4 and the CISPR procedures should end soon as it is expected that the Third Edition of CISPR Pub. 22 will include the substance of the ANSI test procedures.

²⁰ The CISPR procedure is less rigorous in several areas than the ANSI procedure, *e.g.*, the CISPR procedure permits the use of simulators in testing, does not require the connection of as many peripheral devices to a computer, and allows the testing party to disregard brief, transient signals ("clicks"). Use of the more stringent ANSI C63.4 procedure would not cause a device to be rejected for approval in countries following the CISPR standards.

²¹ We would be willing to reconsider the requirement to use ANSI C63.4 if it can be positively demonstrated that foreign countries following the CISPR standards will not accept measurements made using this test procedure.

cordingly, we will require the use of ANSI C63.4 as the test procedure for demonstrating compliance with the CISPR standards.

15. *Measurement distance for radiated emissions.* Part 15 currently specifies a three meter distance for measuring radiated emissions from Class B digital devices.²² Conversely, CISPR Pub. 22 specifies the measurement distance for Class B devices at 10 meters. Except as provided in the standards in CISPR Pub. 22, we did not propose in the *Notice* to change the distance at which radiated emissions from digital devices are measured. AEA, HP, SGI and Tandy request that testing above 1000 MHz be permitted using the same test procedure and measurement distance employed for testing below 1000 MHz. These parties state that this consistency would reduce testing burdens by avoiding the need to reconfigure measurement equipment for testing at frequencies above and below 1000 MHz. Other parties, such as CBEMA, request that we confirm that pre-certification or post-authorization testing by the Commission's Laboratory will be based on the same standard, including the appropriate test equipment, methodology, and measurement distance, as that used by the responsible party. AEA and SGI also request that we revise our standards for Class B devices to specify radiated emissions limits at a distance of 10 meters. They indicate that the 3 meter measurement distance for Class B digital devices is the primary cause for double testing of Class B devices.

16. We agree with the comments that permitting radiated emissions testing above 1000 MHz using the same test procedure and measurement distance used for emissions testing below 1000 MHz will reduce testing burdens by permitting the same test set-up to be employed without reconfiguration. Our primary concern is that the radiated emissions from a Class B digital device may be so low relative to the background noise, when measured at a 10 meter distance, that the emissions would be difficult to locate. However, prior to performing measurements at the distance specified in the regulations, an initial pre-scan of the spectrum is performed at a much closer distance, generally at one meter, allowing the frequencies of the emissions to be readily determined. The levels of these emissions can then be accurately measured at the distance specified in Part 15 or in the CISPR standard.²³ Accordingly, we will allow the same test parameters, including measurement distance, to be used at frequencies above 1000 MHz as those employed below 1000 MHz.

17. We also recognize that the variations in test distance, e.g., from 3 meters to 10 meters, do not always have a corresponding linear variation with the measured emissions levels. Thus, the measurement distance can be critical in demonstrating whether or not a product complies with the standards. For that reason, Part 15 states that testing by the Commission will be performed at whatever distance is specified in the rules.²⁴ Our adoption of the standards in CISPR Pub. 22 as an alternative to the Part 15 standards also implements the test distances associated with those

standards. Testing by the Commission's Laboratory to confirm compliance with the standards, regardless of whether testing is prior to, or subsequent to, authorization, will be performed at the measurement distance specified in which-ever standard is employed by the responsible party. The measurement of emissions above 1000 MHz by the Commission's Laboratory will also be performed at the distance specified in CISPR Pub. 22 when the CISPR standard is used to demonstrate compliance at frequencies below 1000 MHz.

18. We are not, however, changing the regulations to specify the Class B emissions limits at a distance of 10 meters. Such a change is both undesirable and unnecessary. As indicated in the *Notice*, we do not wish to return to regulations that apply different standards to different Part 15 devices and, thus, do not agree that separate emissions limits should be specified for digital devices. Our combined decisions to accept compliance with the CISPR standards, to permit emissions testing above 1000 MHz at the CISPR distances employed below 1000 MHz, and to test sampled equipment at the test distances specified in whatever standard was employed by the responsible party eliminates any need to specify within Part 15 the Class B radiated emissions at 10 meters.

19. *Changes to power supplies.* In the *Notice*, we noted that additional testing may be needed in cases where different power supplies are used to accommodate the different power line voltages and frequencies used in other countries. Amador and EMACO recommend that two tests on AC power line conducted emissions should be performed, one with the unit operating at 60 Hz and another with the unit operating at 50 Hz, but that only one test of radiated emissions, with the unit operating at 60 Hz, is required. AT&T requests that radiated tests be performed with the unit operating at 50 Hz since this would result in test results that are more acceptable to countries outside the U.S. that follow the CISPR standards. CBEMA asks that we clarify the requirements that may be imposed on devices that must be modified to accommodate the different voltages and power supply frequencies in different countries. It submits that only a single test, representative of the configuration that provides the "worst case" emissions during pre-testing, should be required for equipment that can accommodate multiple voltages or frequencies.

20. In considering this issue, we first observe that the design and construction of a power supply, which must incorporate appropriate filtering and bypass circuits, primarily affects whether a device complies with the AC power line conducted emissions standards. The experience of our laboratory staff indicates that operation of a digital device with different AC power supplies, or with a single power supply designed to function at different power line frequencies or voltages, can significantly affect the levels of RF emissions conducted onto the AC power lines.²⁵ Thus, we find that it is necessary to require that digital devices be tested for compliance with the conducted standards as configured for operation with the AC power service available

²² See 47 CFR Section 15.109.

²³ The limit for emissions above 1000 MHz from Class B digital devices is readily converted from 3 meters to 10 meters following the procedure shown in 47 CFR Section 15.31(f)(1). The Part 15 limit of 500 uV/m at 3 meters becomes 150 uV/m at 10 meters. The emissions level for Class A digital devices is already specified at 10 meters.

²⁴ See 47 CFR Section 15.31(f)(4).

²⁵ Digital devices, such as personal computers, are matched to the power systems used in different countries by using different power supplies or by using a single power supply with different operating modes that can accommodate different power line voltages and frequencies.

in the United States. Accordingly, we are requiring that a digital device be tested separately for conducted emissions with each different power supply that will be installed in the equipment when marketed in the United States or, when a power supply that can operate in different modes, *i.e.*, can accommodate various power line voltages and frequencies, with the digital device operating in each mode suitable for connection to the AC power service in this country.²⁶

21. Power supplies are not, however, a primary cause of radiated emissions. The experience of our laboratory staff indicates that the radiated emissions of a digital device do not change substantially when different power supplies are used. The design and construction of the rest of the digital device are the major factors in determining the levels of the radiated emissions. In view of these considerations, we believe it is possible to provide some relief to the *de facto* need for multiple testing when different power supplies or operating modes are needed for use in different countries. We are adopting the two step relaxed approach suggested by CBEMA for measuring radiated emissions in cases where a digital device may be configured with multiple power supplies or different power supply operating modes. In the first step, initial pre-test scans for compliance with radiated emissions are to be conducted with all power supplies and operating modes that are planned to be employed. If this pre-testing indicates that there are no differences in the levels of radiated emissions, we will accept a single set of full tests of radiated emissions from a device as representative of the device's performance regardless of the power source to which it was connected or the operating mode employed for those tests. If there are differences in the levels of the radiated emissions, particularly if there are differences in the levels of radiated emissions at different frequencies, the full tests for radiated emissions shall be performed using the power supply or operating mode that results in the highest levels of radiated emissions. If testing is performed following this procedure, we see no need to require that the full radiated emissions tests be performed using the power supply or operating mode designed for use within the United States.²⁷ We will, of course, also continue to permit digital devices to be tested using only the power supply or operating mode designed for use within the United States.²⁸

²⁶ Sections 2.953(d) and 2.1043 of our rules address the substitution of components in the same power supply to permit operation at different power line voltages or frequencies. Such changes are permitted without re-verification or re-certification only if they do not degrade the emanation characteristics of the equipment or result in a major modification. See 47 CFR Sections 2.953(d) and 2.1043. Sections 2.955 and 2.1033 of our rules require that parties responsible for products subject to our verification or certification requirements either retain or submit certain measurement data. See 47 CFR Sections 2.955 and 2.1033. In cases where multiple conducted emissions measurements are taken for digital devices that may be configured with different power supplies or with power supplies operating in different modes, the responsible parties will be required to maintain test data only for configurations where the power supply is suitable for use with AC power service in the United States.

²⁷ As with measurements of conducted emissions, the responsible parties will be required to maintain test data on radiated emissions only for configurations where the power supply is suitable for use with AC power service in the United States. See

22. *Implementation of the CISPR standard.* In the *Notice*, we proposed to adopt the 1985 version of CISPR Pub. 22 along with a number of specified amendments.²⁹ AT&T submits that the Commission should not require compliance with proposed amendments to CISPR Pub. 22 before they are adopted. It also supports the proposal in the *Notice* to reference the current First Edition of CISPR Pub. 22 (1985 version) and amendments to date, provided the Commission delegates authority to the Chief Engineer to incorporate future versions and amendments to Pub. 22 that do not make substantive changes. Amador, AEA, EMACO, and SGI request that the conducted and radiated standards contained in the 1985 version of CISPR Pub. 22 be adopted, but do not indicate why this version of the CISPR standard should be employed. AEA and SGI add that the Commission should adopt new editions of CISPR Pub. 22 as these are published by the IEC. SGI is hopeful that this can be accomplished through a public notice instead of rule making to improve efficiency. CBEMA and Tandy request that the Commission's regulations allow compliance with whatever CISPR Pub. 22 standard is in effect.

23. In order to allow companies developing digital devices to comply with the most recent version of the CISPR standards, it would be convenient to have our regulations automatically track any changes to the CISPR standards. However, we must also carefully examine substantive changes to determine any impact on our own regulatory interests, employing public notice and comment procedures established under the Administrative Procedures Act.³⁰ Thus, we can not automatically accept substantive CISPR updates without conducting a public rule making proceeding. We also find that adoption of CISPR standards that are already out-of-date, as requested by Amador, AEA, EMACO, and SGI, would not promote harmonization, nor would it simplify international marketing of equipment manufactured in this country. It appears that the CISPR standards for conducted and radiated emissions are fairly stable at this time. At the most, only minor amendments to these standards, based on new information to accommodate the European implementation, are expected in the foreseeable future. Accordingly, we believe the approach suggested by AT&T offers the best solution, and we are adopting the version of the CISPR standards proposed in the *Notice*.³¹ To simplify the rules, the CISPR Pub. 22

footnote 26, *supra*. If full tests of radiated emissions are conducted using a different power supply or power supply operating mode from what would be used in the United States, the justification for using that power supply or operating mode shall also be retained with the test data, *i.e.*, pre-scan testing indicated that there was no difference in the levels of the radiated emissions or it indicated that the configuration used in the final test produced the highest levels of emissions.

²⁸ Our concern is that a digital device marketed for use within the U.S. must comply with the appropriate standards in the configuration in which it is marketed. See 47 CFR Sections 2.803, 2.805, 15.1, 15.27(d), and 15.101(e) and 47 USC 302(b).

²⁹ See footnote 4, *supra*. The Draft International Standards shown as amendments to the 1985 version of CISPR Pub. 22 have been adopted by CISPR. These amendments will be contained in the forthcoming Second Edition of CISPR Pub. 22.

³⁰ See 5 USC 553.

³¹ All of the amendments to the First Edition of CISPR Pub. 22, as shown in footnote 4, *supra*, have been adopted by CISPR. These amendments will be contained in the Second Edition of CISPR Pub. 22. The incorporation of these amendments at this

standards will be added to the regulations by reference.³² Further, for cases where minor changes to these standards, differing by no more than a few dB, are adopted by CISPR, the Commission's Chief Engineer will issue a Public Notice identifying the changes and requesting comments.³³ We are providing the Chief Engineer with delegated authority to adopt the changes into the regulations if the comments responding to the Public Notice are favorable. However, more significant modifications to the CISPR standards will be implemented through a formal rule making proceeding.³⁴

24. *Other Issues.* Apple, AT&T, and CBEMA request that we fully conform our emissions standards for digital devices with the CISPR standards, or seek international standardization and reciprocity.³⁵ These requests are denied. As indicated in the *Notice*, we do not believe it is desirable to establish separate limits for different Part 15 devices, as existed in the past. In addition, there do not appear to be any benefits from establishing separate Part 15 standards for digital devices that conform to the CISPR standards, as the new rules will permit digital devices to comply with either the Commission's current standards or the standards in CISPR Pub. 22. Further, adoption of these requests would require all digital device manufacturers to comply with the slightly more stringent CISPR standards even if their products are not marketed outside of the U.S.

25. AEA and SGI request that the Commission's limits be published in terms of dBuV and dBuV/m, rounded off to the nearest numerical value. They indicate that these units are the internationally accepted units of RF field strength and conducted emissions voltage amplitude and are the units in which most emissions test receivers display signal amplitude. While they note that we already accept these units in compliance test reports, they add that the inclusion of these terms and the rounding off of the decibel value in the rules will eliminate confusion as to the actual values of the limits, simplify limit compliance calculations, and minimize test report preparation errors and time. We do not agree that this change to the regulations is necessary and are denying these requests. As indicated, we already accept test reports with the emissions levels reported in terms of dBuV and dBuV/m. If there is any confusion as to how the existing limits should be converted to units of dBuV and dBuV/m, the conversions are shown in Appendix B.

26. HP requests that the radiated emissions limits between 30 MHz and 230 MHz for Class B digital devices be relaxed to the 34 dBuV/m limit used by Germany.³⁶ HP indicates that digital devices have been operating at this level in Germany without causing harmful interference.

We observe that CISPR has already refused to adopt this limit as a Draft International Standard.³⁷ Thus, adoption of the emission level proposed by HP would not promote international harmonization of the digital device standards, and is outside the scope of this proceeding. Accordingly, this request is denied. Future changes implemented through CISPR Pub. 22 will be considered in accordance with the procedures indicated above.

27. HP requests that the integration of computer systems continue to be permitted whether the systems consist of all Part 15, all CISPR Pub. 22, or a mix of CISPR and Part 15 devices. The integration of computer systems using different components is already permitted under an interpretation of our rules and does not require an amendment of the regulations. System integrators may assemble digital systems from individual components without additional testing, provided all of the components used in the system have the proper equipment authorization, the labelling and identification on the components have not been changed, and any special accessories needed for compliance, e.g., shielded cables, that are specified in the instructions are used during assembly.³⁸

28. IBM requests that digital products be required to be labelled to indicate the standard (FCC or CISPR) under which it was tested. IBM indicates that, due to differences between the CISPR Pub. 22 and the Part 15 test distances and the nonlinear attenuation of these signals with distance, testing a mixture of CISPR Pub. 22 and Part 15 compliant devices could result in an integrated system that fails to meet the limits of either standard. We see no purpose in requiring such labelling, which would place an additional burden on manufacturers. The components used in a resulting system would still comply with our standards, whether compliance is based on the existing Part 15 standards or on the CISPR standards being adopted by reference. Further, the likelihood that an integrated system, that has not been tested for compliance with the standards in the configuration in which it is marketed, will comply with our standards is the same whether the system is configured using components meeting the CISPR Pub. 22 standards, the existing Part 15 standards or a combination of these standards.³⁹ Thus, the probability that harmful interference would be caused to other users of the radio spectrum will not increase, and we are denying this request.

29. *Effective date.* We proposed in the *Notice* to make the changes to the regulations effective upon the date the resulting Report and Order is published in the Federal Register. The commenting parties also indicate that the new rules should become effective as soon as possible since they

time should avoid our having to initiate another rule making proceeding in the near future.

³² Information on how to purchase copies of the CISPR Pub. 22 standards and locations where these standards may be inspected are shown in the amendments to Sections 15.107 and 15.109 in the attached Appendix. The CISPR standards are copyrighted and may not be duplicated.

³³ A copy of any Public Notice issued for this purpose will be published in the Federal Register.

³⁴ The procedures described in this paragraph would also be employed to implement any limits on radiated emissions above 1000 MHz that may eventually be adopted by CISPR, as requested by CRI and Tandy. See footnote 14, *supra*.

³⁵ HP and IBM opposed this request.

³⁶ A limit of 34 dBuV/m exceeds the CISPR limit for Class B

digital devices by 4 dB.

³⁷ Subcommittee G of CISPR recently disapproved changing the Class B radiated emissions limit below 230 MHz to the German limit, as proposed in CISPR/G (Secretariat) 38.

³⁸ See OET Bulletin No. 62, "Understanding the FCC Regulations for Computers and Other Digital Devices," October 1992, at page 10.

³⁹ Integrated systems are required to comply with the standards in the configuration in which they are marketed. See 47 CFR Sections 2.803, 2.805, 15.1, 15.27(d) and 15.101(e), and 47 USC 302(b). The responsible party is responsible for ensuring that the individual components comply. See 47 CFR Section 2.909. The system integrator, i.e., the assembler, is responsible for ensuring that the resulting system complies with the necessary standards.

will result in significant savings to manufacturers in design and testing burdens and costs. As also shown in the preceding paragraphs, these changes to the regulations will not result in an increased potential for harmful interference to other users of the radio spectrum. Accordingly, we are adopting our proposal to make these changes to the rules effective upon publication in the Federal Register.⁴⁰

PROCEDURAL MATTERS

30. *Final Regulatory Flexibility Analysis.* Pursuant to the Regulatory Flexibility Act of 1980, 5 U.S.C. 603, our final analysis is as follows:

I. **Need for and purpose of this action:** This action permits manufacturers of digital devices to comply with the Commission's equipment verification or certification requirements by demonstrating that a device complies with either the current Part 15 standards or the standards in CISPR Pub. 22. The ability to use the CISPR standards for compliance with both domestic and international requirements facilitates the international marketing of digital devices by reducing testing and equipment design burdens.

II. **Summary of issues raised by the public comments in response to the Initial Regulatory Flexibility Analysis:** Tandy, the only party submitting comments in response to the Initial Regulatory Flexibility Analysis, supports the proposals set forth in the *Notice*. It indicates that: 1) U.S. manufacturers, whether large or small, who do not market outside the U.S. would suffer no negative impact if the Commission accepts the CISPR standards for digital devices as an alternative to the Part 15 standards; 2) harmonization of the standards for digital devices may facilitate the entry of small businesses into the global marketplace, particularly the European Community markets; and, 3) the reduction in design and testing costs resulting from these changes to the rules could be the impetus for the entry of smaller U.S. businesses into foreign markets.

III. **Significant alternatives considered and rejected:** All of the commenting parties support harmonization of the standards with those in CISPR Pub. 22. Several commenting parties disagree on the version of the CISPR standard and the test procedure that should be employed. We are adopting the version that is expected to be adopted by CISPR, reducing the probability that our regulations must be modified in the near future, and are providing the Chief Engineer with delegated authority to make minor changes to the standards following notice to the public with opportunity for comment.

31. In accordance with the above discussion and pursuant to the authority contained in Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as amended, IT IS ORDERED that Part 15 of the Commission's Rules and Regulations IS AMENDED as set forth in Appendix C below. These rules and regulations are effective upon publication in the Federal Register. IT IS FURTHER ORDERED that this proceeding IS TERMINATED.

32. For further information on this proceeding, contact John Reed, Technical Standards Branch, Office of Engineering and Technology, at (202) 653-7313.

FEDERAL COMMUNICATIONS COMMISSION


William F. Caton
Acting Secretary

APPENDIX A

Comments to the Notice of Proposed Rule Making were filed by:

AMADOR

American Electronics Association (AEA)
American Radio Relay League, Inc. (The League)
Apple Computer Inc. (Apple)
American Telephone and Telegraph Company (AT&T)
BT North America Inc. (BT)
Burle Industries, Inc. (Burle)
Capital Cities/ABC, Inc. (Capital Cities/ABC)
Cardinal Technologies, Inc. (Cardinal)
The Computer and Business Equipment Manufacturers Association (CBEMA)
Cray Research, Inc. (CRI)
EMACO
Hewlett-Packard Company (HP)
International Business Machines Corporation (IBM)
Silicon Graphics, Inc. (SGI)
Tandem Computers Inc. (Tandem)
Tandy Corporation (Tandy)

Reply comments to the Notice of Proposed Rule Making were filed by:

American Telephone and Telegraph Company (AT&T)
Tandy Corporation (Tandy)

⁴⁰ The regulations being adopted relieve existing restrictions. Accordingly, the requirement that the regulations not become

effective prior to 30 days from publication in the Federal Register does not apply. See 5 USC 553(d)(1).

APPENDIX B

COMPARISON OF CURRENT LIMITS WITH CISPR STANDARDS

Based on First Edition of CISPR Pub. 22, as amended by CISPR/G (Central Office) 2, CISPR/G (Central Office) 9, CISPR/G (Central Office) 11, CISPR/G (Central Office) 12, CISPR/G (Central Office) 13, and CISPR/G (Central Office) 14

Limits on AC Powerline Conducted Emissions

Class A Digital Devices

Frequency (MHz)	FCC Limits		CISPR Limits	
	Voltage (dBuV)* Quasi-peak Average		Voltage (dBuV) Quasi-Peak Average	
0.15-0.45	No Limits		79	66
0.45-0.5	60	None	79	66
0.5-1.705	60	None	73	60
1.705-30	69.5	None	73	60

Class B Digital Devices

Frequency (MHz)	FCC Limits		CISPR Limits	
	Voltage (dBuV)* Quasi-peak Average		Voltage (dBuV) Quasi-Peak Average	
0.15-0.45	No Limits		66-56.9**	56-46.9**
0.45-0.5	48	None	56.9-56**	46.9-46**
0.5-5	48	None	56	46
5-30	48	None	60	50

* The comparison of the FCC and CISPR conducted limits must take into account the differences in measurement procedures. While the FCC does not have a limit on the average value of conducted emissions, the measurement procedure permits the 13 dB to be subtracted from the quasi-peak measurements if the difference between quasi-peak and average measurements is 6 dB or greater. Under this condition, the limit for Class B digital devices becomes 61 dBuV (quasi-peak) and 55 dBuV (average, representing the minimum 6 dB difference). Similarly, for Class A devices the limits become 73 dBuV (quasi-peak) and 67 dBuV (average) for the band 0.45-1.705 MHz and 82.5 dBuV (quasi-peak) and 76.5 dBuV (average) for the band 1.705-30 MHz.

** The limit decreases linearly with the logarithm of the frequency.

Limits on Radiated Emissions

Class A Digital Devices

Frequency (MHz)	FCC Limits*	CISPR Limits*
	Field Strength (dBuV/m) @ 10m	Field Strength (dBuV/m) @ 10m
30-88	39	40
88-216	43.5	40
216-230	46.4	40
230-960	46.4	47
960-1000	49.5	47
> 1000	49.5	No Limit

Class B Digital Devices

Frequency (MHz)	FCC Limits*	CISPR Limits*	
	Field Strength (dBuV/m) @ 3m	Field Strength (dBuV/m) @ 10m	Field Strength (dBuV/m) @ 10m**
30-88	40	29.5	30
88-216	43.5	33	30
216-230	46	35.6	30
230-960	46	35.6	37
960-1000	54	43.5	37
> 1000	54	43.5	No Limit

* The FCC Class B limits were converted to 10 meters using an inverse linear distance extrapolation factor (20 dB/decade), as specified in 47 CFR Section 15.31(f)(1). CISPR limits and FCC limits ≤ 1000 MHz are based on quasi-peak measurements. FCC limits above 1000 MHz are based on the use of an average detector. For emissions above 1000 MHz, 47 CFR Section 15.35 also limits the emissions, measured with a peak detector, to 20 dB above the stated average limit, e.g., peak emissions above 1000 MHz for Class A devices, measured at a distance of 10 meters, shall not exceed 3000 uV/m (69.5 dBuV/m). Measurements above 1000 MHz are required under 47 CFR Section 15.33 when the digital device contains an oscillator operating at 108 MHz or higher.

** CISPR Publication 22 states that if the field strength measurement at 10 meters can not be made because of high ambient noise levels or for other reasons measurements may be made at a closer distance, for example 3 meters. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance. Care should be taken in measurement of large test units at 3 meters at frequencies near 30 MHz due to near field effects.

APPENDIX C

Title 47 of the Code of Federal Regulations, Part 15, is amended as follows:

A. The authority citation for Part 15 continues to read as follows:

Authority: Sec. 4, 302, 303, 304, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, 304 and 307.

B. Section 15.31 is amended by adding a note after subparagraph (a)(6)(iii), to read as follows:

Section 15.31 Measurement standards.

(a) * * *

* * * * *

(6) * * *

* * * * *

(iii) * * *

Note: digital devices tested to show compliance with the provisions of Sections 15.107(e) and 15.109(g) must be tested following the ANSI C63.4 procedure described above.

* * * * *

C. Section 15.107 is amended by redesignating paragraph (d) as paragraph (f), and by adding new paragraphs (d) and (e), to read as follows:

Section 15.107 Conducted limits.

* * * * *

(d) The following option may be employed if the conducted emissions exceed the limits in paragraph (a) or (b) of this Section, as appropriate, when measured using instrumentation employing a quasi-peak detector function: if the level of the emission measured using the quasi-peak instrumentation is 6 dB, or more, higher than the level of the same emission measured with instrumentation having an average detector and a 9 kHz minimum bandwidth, that emission is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13 dB for comparison to the limits. When employing this option, the following conditions shall be observed:

(1) The measuring instrumentation with the average detector shall employ a linear IF amplifier.

(2) Care must be taken not to exceed the dynamic range of the measuring instrument when measuring an emission with a low duty cycle.

(3) The test report required for verification or for an application for a grant of equipment authorization shall contain all details supporting the use of this option.

(e) As an alternative to the conducted limits shown in paragraphs (a) and (b) of this Section, digital devices may be shown to comply with the standards contained in the First Edition of CISPR Pub. 22 (1985), "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment," and the associated Draft International Standards (DISs) adopted in 1992 and published by the International Electrotechnical Commission as documents CISPR/G (Central Office) 2, CISPR/G (Central Office) 5, CISPR/G (Central Office) 9, CISPR/G (Central Office) 11, CISPR/G (Central Office) 12, CISPR/G (Central Office) 13, and CISPR/G (Central Office) 14. This

incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of these CISPR publications may be purchased from the American National Standards Institute (ANSI), Sales Department, 11 West 42nd Street, New York, NY 10036, (212) 642-4900. Copies may also be inspected during normal business hours at the following locations: (1) Federal Communications Commission, 2025 M Street, NW, Office of Engineering and Technology (Room 7317), Washington, DC, and (2) Office of the Federal Register, 800 N. Capitol Street, NW, Suite 700, Washington, DC. In addition:

(1) The test procedure and other requirements specified in this Part shall continue to apply to digital devices.

(2) If the conducted emissions are measured to demonstrate compliance with the alternative standards in this paragraph, compliance must also be demonstrated with the radiated emission limits shown in Section 15.109(g) of this Part.

(f) * * *

D. Section 15.109 is amended by revising the last sentence of paragraph (e), and by adding a new paragraph (g), to read as follows:

Section 15.109 Radiated emission limits.

* * * * *

(e) * * * At frequencies above 30 MHz, the limits in paragraph (a), (b) or (g) of this Section, as appropriate, continue to apply.

* * * * *

(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this Section, digital devices may be shown to comply with the standards contained in the First Edition of CISPR Pub. 22 (1985), "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment," and the associated Draft International Standards (DISs) adopted in 1992 and published by the International Electrotechnical Commission as documents CISPR/G (Central Office) 2, CISPR/G (Central Office) 5, CISPR/G (Central Office) 9, CISPR/G (Central Office) 11, CISPR/G (Central Office) 12, CISPR/G (Central Office) 13, and CISPR/G (Central Office) 14. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of these CISPR publications may be purchased from the American National Standards Institute (ANSI), Sales Department, 11 West 42nd Street, New York, NY 10036, (212) 642-4900. Copies may also be inspected during normal business hours at the following locations: (1) Federal Communications Commission, 2025 M Street, NW, Office of Engineering and Technology (Room 7317), Washington, DC, and (2) Office of the Federal Register, 800 N. Capitol Street, NW, Suite 700, Washington, DC. In addition:

(1) The test procedure and other requirements specified in this Part shall continue to apply to digital devices.

(2) If, in accordance with Section 15.33 of this Part, measurements must be performed above 1000 MHz, compliance above 1000 MHz shall be demonstrated with the

emission limit in paragraph (a) or (b) of this Section, as appropriate. Measurements above 1000 MHz may be performed at the distance specified in the CISPR 22 publications for measurements below 1000 MHz provided the limits in paragraphs (a) and (b) of this Section are extrapolated to the new measurement distance using an inverse linear distance extrapolation factor (20 dB/decade), *e.g.*, the radiated limit above 1000 MHz for a Class B digital device is 150 uV/m, as measured at a distance of 10 meters.

(3) The measurement distances shown in CISPR Pub. 22, including measurements made in accordance with this paragraph above 1000 MHz, are considered, for the purpose of Section 15.31(f)(4) of this Part, to be the measurement distances specified in the regulations.

(4) If the radiated emissions are measured to demonstrate compliance with the alternative standards in this paragraph, compliance must also be demonstrated with the conducted limits shown in Section 15.107(e) of this Part.

E. Section 15.207 is amended by redesignating paragraphs (b) and (c) as paragraphs (c) and (d), respectively, and by adding a new paragraph (b), to read as follows:

Section 15.207 Conducted limits.

* * * * *

(b) The following option may be employed if the conducted emissions exceed the limits in paragraph (a) of this Section when measured using instrumentation employing a quasi-peak detector function: if the level of the emission measured using the quasi-peak instrumentation is 6 dB, or more, higher than the level of the same emission measured with instrumentation having an average detector and a 9 kHz minimum bandwidth, that emission is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13 dB for comparison to the limits. When employing this option, the following conditions shall be observed:

(1) The measuring instrumentation with the average detector shall employ a linear IF amplifier.

(2) Care must be taken not to exceed the dynamic range of the measuring instrument when measuring an emission with a low duty cycle.

(3) The test report required for verification or for an application for a grant of equipment authorization shall contain all details supporting the use of this option.

(c) * * *

(d) * * *